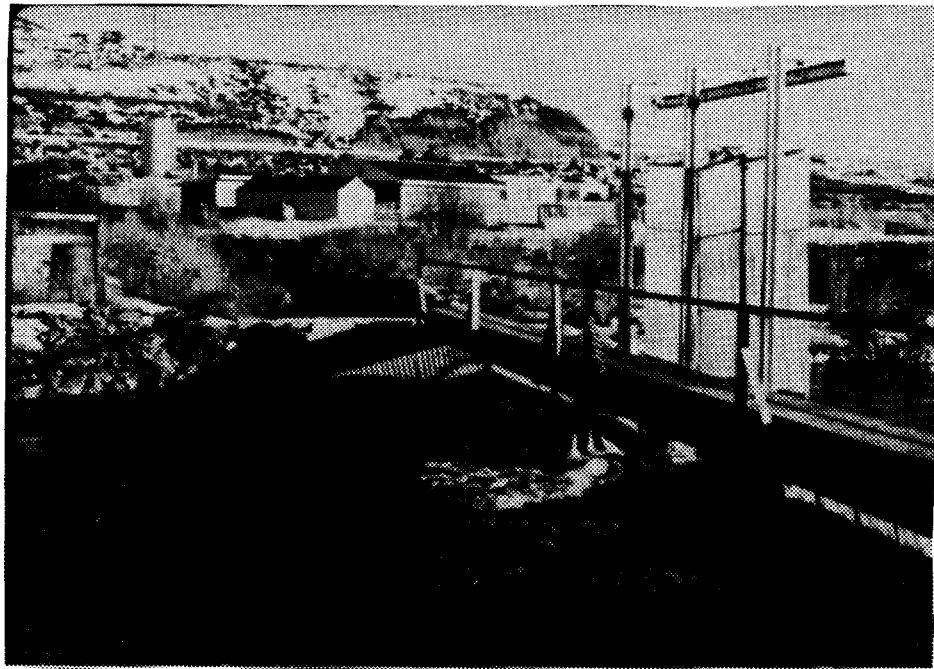




PAHSIMEROI HATCHERY

1991 Summer Chinook Brood Year Report



by

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ABSTRACT

The trap was set up on June 1, 1991. Chinook salmon started entering the trap on June 4, with the majority of the run concluding by September 25. The trap was pulled on October 1. A total of 6 spring chinook females, and 238 summer chinook (88 males, 130 females, and 20 jacks) were trapped during 1991.

The six spring chinook females were spawned and their eggs were shipped, unfertilized, to Rapid River Hatchery. They were fertilized at Rapid River and placed in the incubators for hatching. These spring females produced 22,235 green eggs, with an average of 3,706 eggs per female. The eye-up was 70.09% for a total of 15,584 eyed eggs.

All the summer chinook that entered the trap this year were injected with erythromycin phosphate. The prespawning mortality amounted to only 2 females, or less than 1% of the run. This has been the best holding pond record in the last decade.

A total of 87 summer chinook females were spawned for 437,157 green eggs. Fecundity averaged 5,025 eggs and an eye-up of 96.7% was achieved leaving 422,766 eyed eggs.

The 375,000 smolts were released during the week of April 14-19, 1993. Fish totalling 190,800 were released from pond one, amounting to 15,140 lbs at 12.6 fish/lb, with a conversion of 1.89. From pond two, 184,200 fish were released for a total of 13,486 lbs at 13.7 fish/lb, with a conversion of 2.08 for the rearing cycle.

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INTRODUCTION

Pahsimeroi Hatchery is owned and funded by Idaho Power Company (IPC) and is operated by the Idaho Department of Fish and Game (IDFG). The salmon and steelhead programs are mitigation for the IPC dams constructed on the Snake River in Hells Canyon. The hatchery is located near Ellis, Idaho; one mile upstream on the Pahsimeroi River, with the final chinook rearing ponds located at a separate facility seven miles upstream on the Pahsimeroi River.

OBJECTIVES

The mitigation of Pahsimeroi Hatchery is to rear one million summer chinook smolts for release into the Pahsimeroi River.

The Department goals are to trap and spawn summer chinook adults returning to the Pahsimeroi River. Release one million summer chinook smolts into the Pahsimeroi River, release adult summer chinook salmon above the hatchery weir in sufficient numbers to be self-sustaining.

HATCHERY FACILITIES

Located at the hatchery is a fish trap constructed of three concrete pens measuring 15 ft x 75 ft x 4.5 ft deep. Adult fish are held in these pens until they are spawned. The trap has a series of ladders in the structure, and a metal grate that keeps the fish from returning to the river. A 55-ft-long weir crosses the Pahsimeroi River to guide the arriving fish into the trap facility.

Near the trap facility lies a residence, two pump houses, a 10,000-gallon water storage tank, a metal shop building, a cinderblock office building, a public restroom, an incubator room with capacity for 20 double stacks of Heath incubators, and a building with a two-bedroom dormitory and workshop. Four concrete raceways (4 ft x 100 ft) are used for early rearing of salmon and steelhead fry.

Two dirt rearing ponds (40 ft x 300 ft) are located seven miles above the trap at a separate facility.

These are used to rear summer chinook smolts. Facilities at the upper site include a residence, a small storage building, a feed bin for storing dry bulk feed, and a walk-in freezer for storing frozen salmon feed.

WATER SUPPLY

Water for the hatchery is supplied by the Pahsimeroi River, and varies in temperature from 32°F during the winter to 67°F in summer (Appendix 5). The hatchery has water rights for 20 cubic feet per second (cfs) at the upper ponds and 40 cfs at the lower fish trap and ponds.

The river water has a high organic load during winter, but improves during the summer months. In addition, the hatchery has .5 cfs spring water available for its egg incubation system. Its temperature varies from 52°F in the winter to 55°F in the summer, and has a pH of 7.8.

SPRING CHINOOK TRAPPING

The first spring chinook arrived on June 4 and the last on June 30. The run consisted of six females. Fork lengths were taken on all fish entering the trap (Appendix 2). The age class breakdown was done by length this year. Fish that measured 65 cm through 82 cm were classified as four-year-olds, and all fish 83 cm and over were classified as five-year-olds. This gives an overall breakdown of 5 four-year-olds and 1 five-year-old.

SPRING CHINOOK SPAWNING INFORMATION

The spring chinook spawning began on August 30 and concluded September 6. A total of six females were spawned and their eggs were shipped unfertilized to Rapid River Hatchery. The females averaged 3,706 eggs per female for 22,235 green eggs. Average egg size was 11.10 ml/50. Eye-up was 70.09% for a total of 15,584 eyed eggs.

SUMMER CHINOOK TRAPPING

Trapping for summer chinook started on July 1 and ended on October 1 (Appendices 1 and 8). The run consisted of 218 adults and 20 jacks, for a total of 238 fish. This breaks down to 130 females and 108 males. Fork lengths were taken on all fish entering the trap (Appendices 2, 3, and 4). The age class breakdown was done by length this year. All males 61 cm and under were classified as jacks. Male and female fish that measured 62 cm through 82 cm were classified as four-year-olds, and all fish 83 cm and over were classified as five-year-olds. This gives an overall breakdown of 20 jacks, 139 four-year-olds, and 79 five-year-olds.

Pre-spawning mortality was the lowest it has been in the last decade. It amounted to only two females, less than 1.0% of the run.

HOLDING POND RECORD

All fish that entered the trap this year were injected with erythromycin phosphate at the rate of 10 mg/kg of fish weight to help prevent Bacterial Kidney Disease (BKD) mortalities.

In addition, the females were treated for nine weeks, three times a week, for one hour with 166.7 ppm formalin.

Holding pond water temperatures got up to 68°F during the afternoons, so several other things were done to maintain the health of the brood fish. A black plastic shade cover was placed over the water of the female pen to reduce the stress from the public. The yard lights were turned off and kept out all summer to induce the fish to ripen earlier. The fish were left undisturbed after their initial sorting in the trap until August 19, when we started sorting for ripe fish.

Of the 130 females and 108 males trapped, their disposition is as follows:

FEMALES

40 released
87 spawned
2 prespawning mortality
1 green reject

MALES

14 jacks held - 3 spawned
58 adults available for spawning
30 adults released
6 jacks released

SUMMER CHINOOK RELEASE

One-third of the run was released above the weir to spawn naturally in the Pahsimeroi River. These fish were released all through the season as they entered the trap. The released fish amounted to 40 females, 30 adult males, and 6 jacks (Appendix 7).

SUMMER CHINOOK SPAWNING INFORMATION

Summer chinook spawning began on August 27 and concluded on September 30 (Appendix 8). A total of 87 females were spawned for 437,157 green eggs. Fecundity averaged 5,025 eggs per female, and the average eye-up was 96.71% for 422,766 eyed eggs. The average egg displacement was 12.78 ml/50 eggs.

SPAWNING TECHNIQUE

Females were sorted twice a week for ripeness. Ripe fish were killed by a blow to the head, and bled by severing the caudal artery. Salmon were spawned at a ratio of one female to one male, with at least 3% of the males being jacks. The eggs were hand-stirred and allowed to sit for five minutes. The eggs were then loaded into the incubator trays with one female per tray. Each of these trays, containing a 100-ppm iodine solution (Argentyne), was then allowed to sit for one-half hour before being put back into the water flow of the incubator stack.

Daily treatments of 1,667-ppm formalin were used to reduce fungus growth before eye-up. The eyed eggs were shocked and then hand picked.

Dead eggs were counted and measured using the displacement method. The number of eggs in each tray was measured by milliliter displacement. Each tray was then run through an electronic counter and the counts compared. The eggs were then placed back into trays at 1,000 ml per tray for hatching. The dead egg numbers were taken from the initial green egg numbers to get the percent eye-up.

On October 23, after all lots of the eggs were eyed and picked, the incubator system was switched from spring water to the cooler river water to retard fry development.

EGG SHIPMENTS

Eyed eggs were transferred to Sawtooth Hatchery from six lots this year. These 150,000 eggs were reared in spring water to compare fish size and whirling disease contraction.

ADULT DISEASE SAMPLING

All females were individually disease sampled, with kidney and ovarian fluid being taken from each female spawned. The males were sampled when they were killed. Kidney, spleen, and pyloric caeca samples were taken and were combined into five male pools. Results of sampling indicated a 7% BKD incidence in the adults and one fish positive for IHNV.

CARCASS DISPOSITION

Ponded fish were injected with erythromycin and treated externally with formalin because of the warm, low water this summer. Since the fish were treated, the carcasses had to be hauled to the landfill to be buried.

FISH PRODUCTION

Transfer of salmon fry into the raceways began during mid-November, and continued through February. Initially, these fish were hand-fed BioDiet starter and grower at a rate of 3% of body weight. During March, all fish were fed a 4.5% Gallimycin feed mixture as a prophylactic treatment for Kidney Disease. The treatment rate was 10 mg/kg fish daily for a 21-day period.

The fish were ponded during mid to late May this year after being marked. The 140,138 fish reared in spring water at Sawtooth were marked and trucked directly to the holding ponds. The Pahsimeroi-reared fish were marked in the raceways and hauled to the ponds. Pond one received 193,480 fish (71,341 Sawtooth reared), and pond two received 187,390 fish (68,797 Sawtooth).

All fish were fed Bio Products BioMoist feed pellets after ponding, with another 21-day gallimycin treatment starting in late July. Total feed fed was 58,750 lbs for a total conversion of 2.05.

FISH RELEASES

A total of 375,000 chinook salmon smolts (28,626 lbs at 13.1/lb) were released during the week of April 14-19, 1993.

These smolts were held an extra month before being released this year. The screens and one set of dam boards were pulled daily until the ponds were emptied. During normal release years, it usually takes several days before the fish start to move out of the ponds, and it is usually a week before the fish are seen at the lower facility. Any fish remaining after the boards are pulled usually have to be forced out of the ponds.

This year, the screens and one set of boards were pulled on April 14, 1993. By the morning of the 15, one-third of the fish were out of the ponds, and large numbers of smolts had been trapped in the smolt monitoring screw trap that the research crew had installed in the river at the lower facility. By the morning of the 16, one-half of the fish were out of the ponds; by the 17, over two-thirds were out; and by the 18, less than one-eighth of the fish were remaining. All the fish were out of the ponds by the 19.

FISH HEALTH

Diseases Encountered and Treatment

Pahsimeroi Hatchery fish have perennial problems with environmental gill disease while in the raceways at the main facility. In the past, this problem has been controlled successfully with either Benzalkonium Chloride or Chloramine-T. Due to FDA regulations, we were not able to utilize these chemotherapeutants. A 10% loss was experienced until the fish were transferred to the upper facility (ponds) and was attributed to Bacterial Gill Disease and pinheading. This loss was about normal from previous experience.

An attempt to manage around whirling disease (WD) was implemented with one third of the total production of Pahsimeroi early-reared at Sawtooth Hatchery completely on well water. Fish that were not early-reared at Sawtooth Hatchery did not show signs of the disease as dramatically as expected. Usually WD samples taken from Pahsimeroi show higher levels of infection and higher percentages of fish infected. Previous years had samples (pools) which were 100% infected. This year, positive samples were scattered. Fish did not show the signs of disease while in the ponds. There were not any apparent reasons for a reduction in prevalence of this disease. As of now, department pathologists do not have an explanation for the absence of disease. Certainly, early-rearing on well water allows the host to become refractory to the disease, but only one-third of the fish were handled in this fashion. Our assessment of the problem continues.

Renibacterium salmoninarum was found in both brood and juvenile samples via ELISA. No mortalities could be attributed to BKD at this facility. Two prophylactic treatments of erythromycin-medicated feed were administered to the Pahsimeroi summer chinook juveniles (21 days at 10 mg/kg). Brood fish were injected once with either a high dose of 20 mg/kg or a low dose of 10 mg/kg. This protocol has been established in support of the INAD field testing for erythromycin.

Other Assessments

The lack of overt signs of whirling disease was the most outstanding fish health event at Pahsimeroi this year. Although Eagle Fish Health Laboratory was able to detect M. cerebralis infection, the disease associated with this parasite was not readily apparent.

As per usual, fish reared in the earthen ponds at Pahsimeroi were very robust animals. After the second erythromycin-medicated feeding, a toxicity test was implemented. One fish went into tetany and died (1 out of 60 fish).

WHIRLING DISEASE EXPERIMENT

This year, 150,000 eyed summer chinook eggs were shipped to Sawtooth Hatchery for early hatching and rearing in specific pathogen free spring water.

The fingerling were later returned to Pahsimeroi at different fish size, and placed in outdoor raceways supplied with contaminated river water. After a holding period, these fish were sampled for incidence of whirling disease. This was done to determine the size at which Pahsimeroi Hatchery summer chinook fingerling develop a resistance to whirling disease (Appendix 9).

The lots were returned to the Pahsimeroi River as follows: Lot 1 - April 15; Lot 2 - May 6; Lot 3 - June 12; and Lot 4 - July 14, 1992. These fish were sampled six months later. Lot 1 was 50% positive, Lot 2 was 75% positive, Lot 3 was 12.5% positive, and Lot 4 was found to be negative for Whirling Disease organisms.

These fish also received different coded-wire tag codes so that their return rates can be evaluated.

FISH MARKING

All the fish were marked with a fin-clip or were coded-wire tagged (CWT) during May, prior to ponding this year. The fish reared at Sawtooth were marked with a different CWT code than the Pahsimeroi reared fish. The numbers and marks are as follows:

NUMBER OF FISH

21,352	CWT	10/49/31	ad	
21,266	CWT	10/49/32	ad	
22,300	CWT	10/49/33	ad	
22,393	CWT	10/49/34	ad	
21,661	CWT	10/49/35	ad	
22,542	CWT	10/49/36	ad	
10,389	CWT	10/49/39	ad	Whirling Disease Study
10,157	CWT	10/49/40	ad	Whirling Disease Study
11,014	CWT	10/49/41	ad	Whirling Disease Study
9,603	CWT	10/49/42	ad	Whirling Disease Study

HATCHERY IMPROVEMENTS

Hatchery improvements during this brood year include new railings on walkways over river weir, new trap fence and cement steps, measuring weir in canal to trap was reset and repaired.

STAFFING

The hatchery is staffed with two permanent employees; a Hatchery Superintendent II and a Hatchery Superintendent I. Several temporaries are employed at various times of the year to help with the spawning of steelhead and salmon.

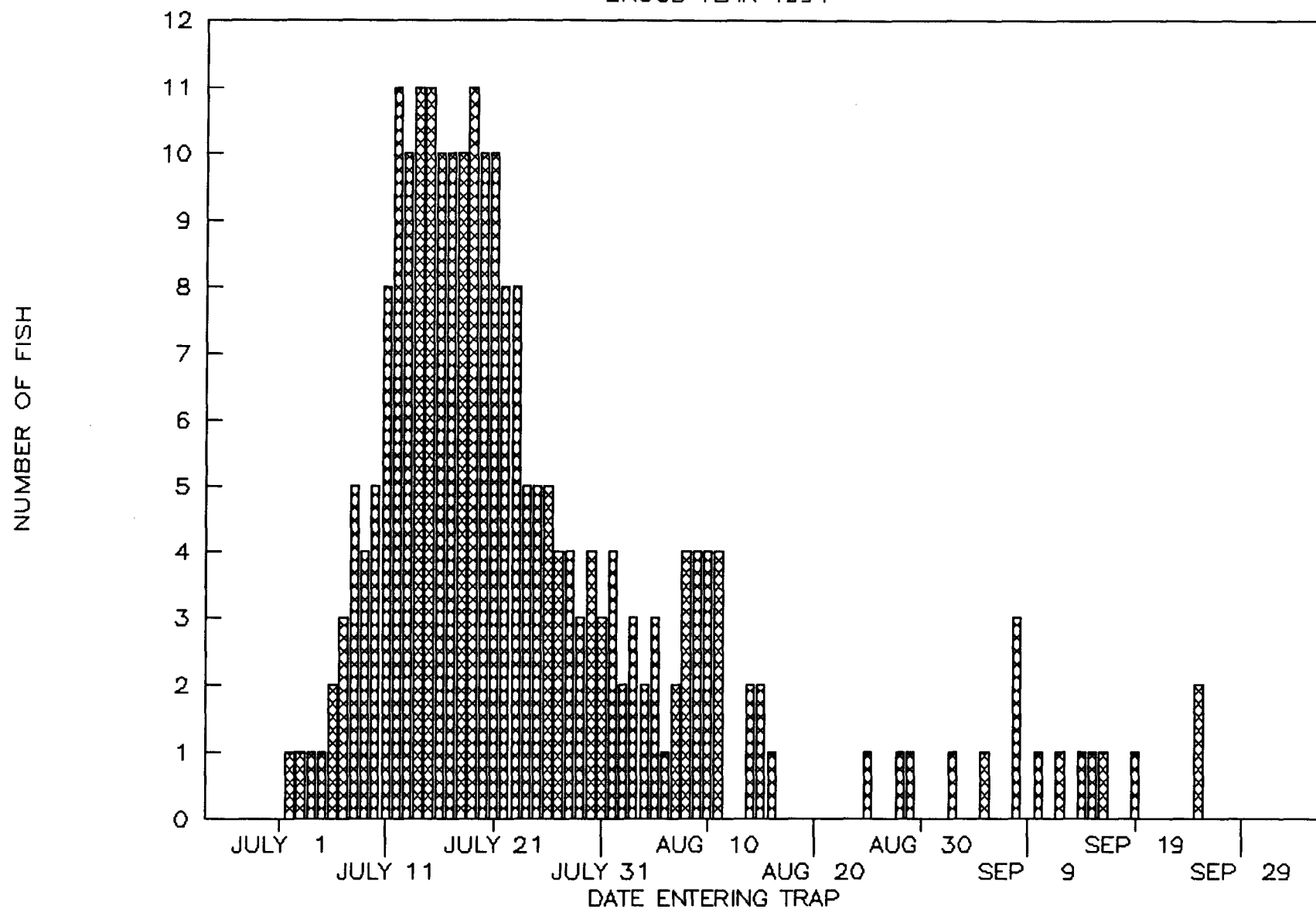
ACKNOWLEDGEMENTS

The crew at Pahsimeroi Hatchery would like to express their appreciation to all those who helped with the spawning, and transporting of steelhead and salmon. We would also like to thank Paul Abbott and the staff of Idaho Power Company for their continued help and support.

A P P E N D I C E S

PAHSIMEROI SUMMER CHINOOK SALMON RUN

BROOD YEAR 1991



Appendix 1. Brood year 1991 chinook salmon run timing.

Appendix 2. Length frequency of total chinook trapped, 1991.

(cm) Length	Spring females	Summer		(in) Length	Summer Jacks		
		Males	Females		cm	Total	inches
62	1	1		24.4	37	1	14.6
63				24.8	38		15.0
64		1		25.2	39		15.4
65	1	2	1	25.6	40		15.7
66		3	1	26.0	41		16.1
67		5	3	26.4	42	1	16.5
68		4		26.8	43		16.9
69	1	1	2	27.2	44		17.3
70	1	2	4	27.6	45		17.7
71		5	5	28.0	46	1	18.1
72	1	2	4	28.3	47	5	18.5
73		3	6	28.7	48	1	18.9
74		3	3	29.1	49		19.3
75		5	10	29.5	50		19.7
76		4	4	29.9	51	2	20.1
77		3	4	30.3	52	1	20.5
78		4	9	30.7	53		20.9
79		5	6	31.1	54		21.3
80		4	5	31.5	55		21.7
81		3	5	31.9	56	2	22.0
82		2	4	32.3	57	3	22.4
83		2	3	32.7	58	2	22.8
84		1	8	33.1	59	1	23.2
85		5	7	33.5	60		23.6
86	1	1	5	33.9	61		24.0
87		2	8	34.2			
88		2	6	34.6		20	
89		2	3	35.0			
90		1	3	35.4			
91		1		35.8			
92		4	2	36.2			
93		2	5	36.6			
94		1	1	37.0			
95		1	1	37.4			
96				37.8			
97				38.2			
98		2		38.6			
99				39.0			
100	—	1	—	39.4			
	6	90	128				

Length Frequency Breakdowns
(Male and Female)

Jacks = 61 cm & under
4-yr-olds = 62 cm - 82 cm
5-yr-olds = 83 cm & over

Age Class	Spring female	Summer		Summer Total
		Male	Female	
3-yr-olds		20		20
4-yr-olds	5	61	78	139
5-yr-olds	1	27	52	79
Total	6	108	130	238

Appendix 3. Length frequency of spawned summer chinook, 1991.

	Length	Jacks	Males	Females	Length
	46	1			18.1
	47	4			18.5
	48	1			18.9
	49				19.3
	*52	1			20.5
	*56	2			22.0
	57	2			22.4
	58	2			22.8
	59	1			23.2
	60				23.6
end 3-yr-old	61				24.0
4-yr-old	62		1		24.4
	63				24.8
	64				25.2
	65		2	1	25.6
S	66		1		26.0
P	67		4	1	26.4
A	68		3		26.8
W	69		1	1	27.2
N	70			2	27.6
E	71		4	2	28.0
D	72		2	2	28.3
	73		2	7	28.7
F	74		2	1	29.1
I	75		5	5	29.5
S	76			2	29.9
H	77		2	4	30.3
	78		4	7	30.7
	79		2	5	31.1
	80		2	3	31.5
	81		2	3	31.9
end 4-yr-old	82			4	32.3
5-yr-old	83		1	2	32.7
	84			5	33.1
	85		2	6	33.5
	86		1	4	33.9
	87		1	5	34.3
	88		1	5	34.6
	89		2	3	35.0
	90		1	3	35.4
	91		1		35.8
	92		3	1	36.2
	93		2	4	36.6
	94		1	1	37.0

Appendix 3. Continued.

Length	Jacks	Males	Females	Length
95		1	1	37.4
96				38.2
97				37.8
98		2		38.6
99				39.0
100		1		39.4
101				39.8

General Length frequency breakdowns, male and female:

Jacks = 61 cm and under, 4-yr-olds = 62 cm to 82 cm, 5-yr-olds 83 cm and over.

Appendix 4. Length frequency of released summer chinook, 1991.

	Male lengths (cm)		Female length (cm)	
	Released	Ponded	Released	Ponded
1	37.0 JR	46.0 J	66.5 R	65.0 D
2	42.5 JR	47.0 J	67.0 R	67.0
3	47.0 JR	47.0 J	67.0 R	69.0
4	51.0 JR	47.0 J	69.0 R	70.0
5	51.0 JR	47.0 J	70.0 R	70.0
6	57.0 JR	48.0 JD	70.0 RD	71.0
7	64.0 R	52.0 J	71.0 R	71.0 D
8	66.0 RD	56.0 J	71.0 RD	72.0
9	66.0 RD	56.0 J	71.0 RD	72.0
10	67.0 R	57.0 J	72.0 R	73.0
11	68.0 RD	57.0 J	72.0 RD	73.0
12	70.0 R	58.0 JD	74.0 R	73.0
13	70.0 R	58.0 JD	74.0 R	73.0
14	71.0 R	59.0 J	75.0 R	73.0
15	74.0 R	62.0 D	75.0 R	73.0 D
16	76.0 R	65.0	75.0 R	73.0 D
17	76.0 R	65.0 D	75.0 R	74.0 D
18	76.0 R	66.0	75.0 R	75.0
19	76.0 R	67.0	76.0 R	75.0
20	77.0 R	67.0	76.0 R	75.0
21	79.0 R	67.0	78.0 RD	75.0
22	79.0 R	67.0 D	78.0 RD	75.0 D
23	80.0 R	68.0	79.0 R	76.0
24	80.0 R	68.0	79.0 R	76.0
25	81.0 R	68.0 ad	80.0 R	77.0
26	82.0 R	69.0	80.0 R	77.0
27	82.0 R	71.0	81.0 R	77.0
28	83.0 R	71.0	81.0 R	77.0 D
29	84.0 R	71.0	83.0 R	78.0
30	85.0 R	71.0	84.0 R	78.0
31	85.0 R	72.0 D	84.0 R	78.0
32	85.0 R	72.5	84.0 R	78.0
33	87.0 R	73.0	85.0 R	78.0 D
34	88.0 R	73.0	86.0 R	78.0 D
35	92.0 R	74.0	87.0 R	78.0 T
36		74.0	87.0 R	79.0
37		75.0	87.0 R	79.0
38		75.0	88.0 R	79.0
39		75.0	92.0 R	79.0
40		75.0	93.0 R	79.0
41		75.0		80.0
42		77.0		80.0
43		77.0		80.0 D
44		78.0		81.0
45		78.0		81.0

Appendix 4. Continued.

	Male lengths (cm)		Female length (cm)	
	Released	Ponded	Released	Ponded
46		78.0		81.0
47		78.0 T		82.0
48		79.0		82.0
49		79.0		82.0
50		80.0		82.0 T
51		80.0		83.0
52		81.0		83.0 T
53		81.0 D		84.0

JR = jack released, R = adult released, RD = released with whirling disease,
J = jack ponded, D = whirling disease, ad = ad-marked fish, T = jaw-tagged.

Appendix 5. Pahsimeroi Hatchery run timing for brood year 1991.

Date	Total	Jacks	Males	Females
Jul 1	0			
2	1			1
3	1		1	
4	1		1	
5	1			1
6	2	1	1	
7	3	1	2	
8	5	1	2	2
9	4	1	2	1
10	5		2	3
11	8	1	3	4
12	11		1	10
13	10		3	7
14	11		4	7
15	11		4	7
16	10	1	3	6
17	10		4	6
18	10		4	6
19	11		4	7
20	10		3	7
21	10	1	4	5
22	8		4	4
23	8	1	3	4
24	5	1	1	3
25	5		2	3
26	5	1	2	3
27	4	1	1	2
28	4	1	3	
29	3		1	2
30	4	1	1	2
31	3	1	1	1
AUG 1	4	1	1	2
2	2		1	1
3	3		1	2
4	2			2
5	3		2	1
6	1			1
7	2		1	1
8	4	1	2	1
9	4	1	1	2
10	4	1	1	2
11	4	1	1	2
12	0			
13	0			
14	2		1	1
15	2		1	1
16	1	1		

Appendix 5. Continued.

Date	Total	Jacks	Males	Females
17	0			
18	0			
19	0			
20	0			
21	0			
22	0			
23	0			
24	0			
25	1			1
26	0			
27	0			
28	1		1	
29	1			1
30	0			
31	0			
SEP 1	0			
2	1			1
3	0			
4	0			
5	1			1
6	0			
7	0			
8	3		2	1
9	0			
10	1		1	
11	0			
12	1		1	
13	0			
14	1		1	
15	1		1	
16	1			1
17	0			
18	0			
19	1			1
20	0			
21	0			
22	0			
23	0			
24	0			
25	2		1	1
26	0			
27	0			
28	0			
29	0			
30	0			
TOTAL	238	20	88	130

Appendix 6. Brood year 1991 summer chinook Whirling Disease experiment.

Date	Size fish/lb	Number sampled	Comments
Lot 1 - Raceway #3			
04/15/92	275	0	Arrived from Sawtooth Hatchery
10/15/92	29.74	20	0/20 positive
10/28/92	28.91	4	2/4 positive
Lot 2 - Raceway #2			
05/06/92	150	0	Arrived from Sawtooth Hatchery
11/06/92	31.52	20	0/20 positive
11/19/92	30.82	20	15/20 positive
Lot 3 - Raceway #1			
06/12/92	100	0	Arrived from Sawtooth Hatchery
12/12/92	23.09	20	0/20 positive
12/25/92	24.74	24	3/24 positive
Lot 4 - Raceway #4			
07/14/92	50	0	Arrived from Sawtooth Hatchery
01/14/93	26.27	20	0/20 positive
01/26/93	21.83	4	0/4 positive

Appendix 7. Pahsimeroi Hatchery summer chinook and spring chinook releases and returns.

Date released	Number	3-yrs	4-yrs	5-yrs	Total	Year of return	Percent return
summer chinook							
May 1970	300,000	89	N/A	101	N/A	71,72,73	N/A
May 1971	250,000	40	425	14	479	72,73,74	0.192
May 1972	250,000	20	138	76	234	73,74,75	0.094
May 1973	347,000	1	5	32	38	74,75,75	0.011
May 1974	330,000	8	189	436	633	75,76,77	0.192
May 1975	114,000	53	115	X	X	76,77,78	X
May 1976	121,000	7	X	32	X	77,78,79	X
May 1977	235,000	X	0	4	X	78,79,80	X
May 1978	218,000	1	29	13	43	79,80,81	0.020
May 1983	13,690	11	72	30	113	84,85,86	0.825
Apr 1984	55,800	27	278	52	357	85,86,87	0.640
Apr 1985	209,155	37	408	716	1,161	86,87,88	0.555
Mar 1986	12,095	13	47	31	91	87,88,89	0.752
Mar 1987	258,600	75	180	42	297	88,89,90	0.115
Mar 1988	598,500	135	389	79	603	89,90,91	0.101
Mar 1989	1,016,300	39	139	27	205	90,91,92	
Mar 1990	1,058,000	20	98			91,92,93	
Mar 1991	227,500	6				92,93,94	
Mar 1992	605,900					93,94,95	
Apr 1993	375,000					94,95,96	

Appendix 7. Continued.

<u>Date released</u>	<u>Number</u>	<u>3-yrs</u>	<u>4-yrs</u>	<u>5-yrs</u>	<u>Total</u>	<u>Year of return</u>	<u>Percent return</u>
spring chinook							
Mar 1983	437,332	97	1,568	398	2,063	84,85,86	0.472
Apr 1984	1,143,029	480	6,019	1,463	7,962	85,86,87	0.697
Apr 1985	178,782	101	677	216	994	86,87,88	0.556
Mar 1986	80,948	35	185	49	269	87,88,89	0.332

Submitted by:

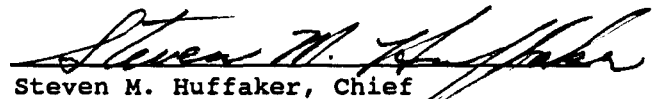
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